

Chapter 5B- The Working Cell

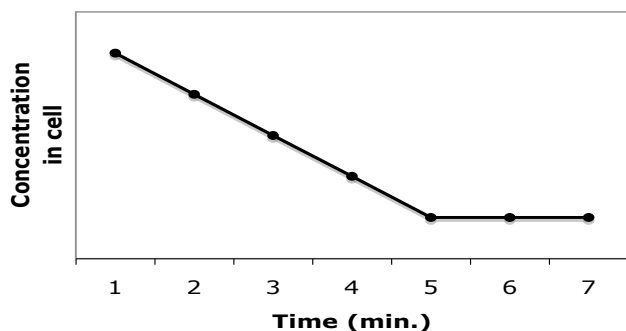
Cellular Transport-II

Examining Cause and Effect

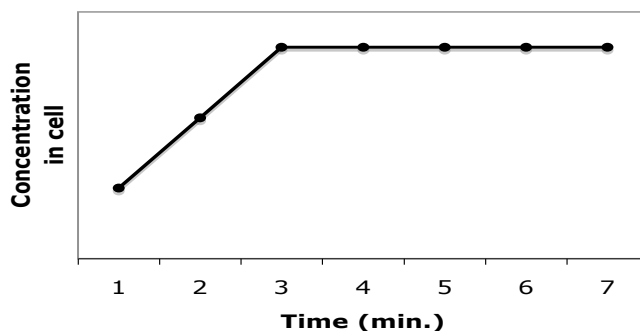
Cells regulate the kinds and amounts of materials that enter and leave the cytoplasm. This regulation maintains the cytoplasm's chemical balance.

A. Study the graphs below. Then answer the questions below.

Graph A



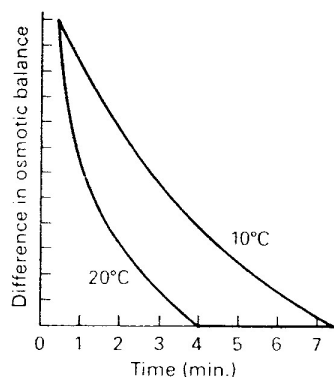
Graph B



1. Which graph illustrates an initially hypertonic cell? _____
2. Which graph illustrates an initially hypotonic cell? _____
3. In graph A, what caused the drop in the line from one to five minutes?

4. In graph B, the line continues horizontally for several minutes. What does this indicate?

B. Study the graph below and then answer the following question.

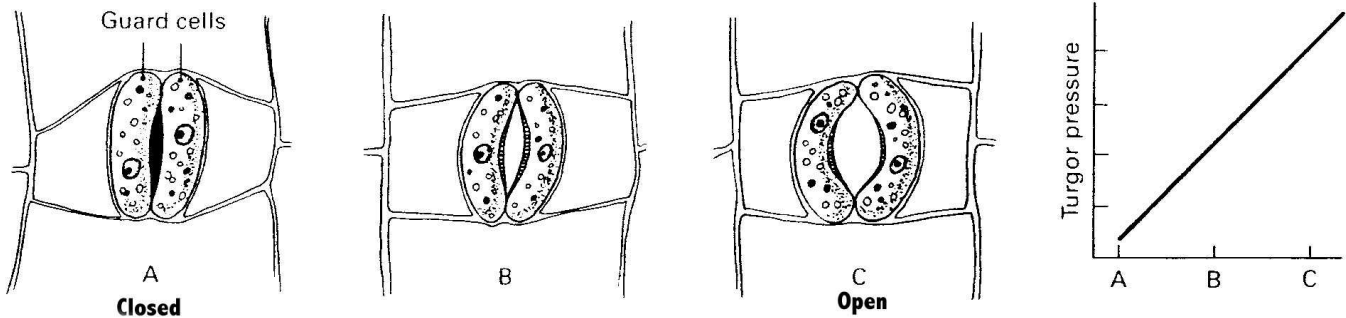


This graph shows the effect that temperature has on time required to reach equilibrium in a cell placed in a hypertonic solution. At 10° the concentration of solutes in the cell and the solution become equal in seven minutes. Describe how raising the temperature of the solution to 20° affects the time necessary for equilibrium.

Turgor Pressure in Plant Cells

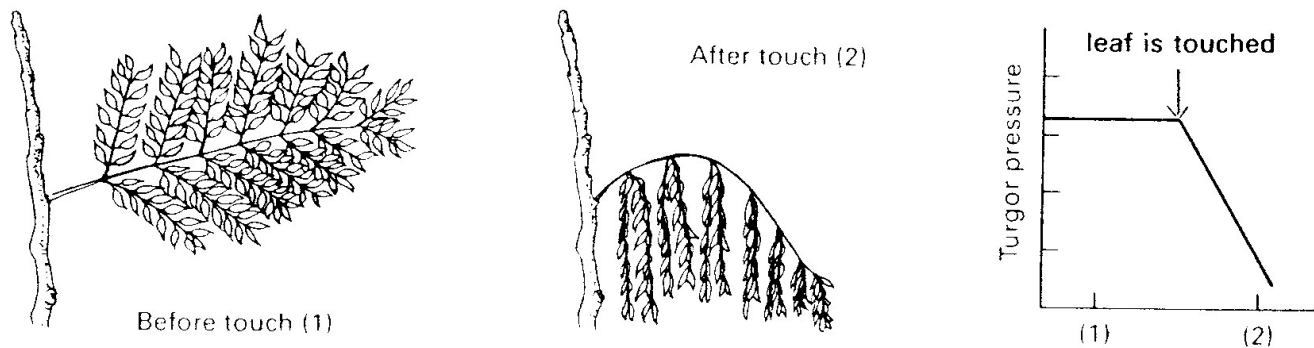
The osmotic balance of cells is an important factor in keeping the cells working properly. Sometimes the primary function of a cell may be directly related to the amount of water it holds.

A. One of the functions of the cells on the bottom surface of leaves is to regulate gases entering and leaving the leaf tissue. The passage of gases into and out of a leaf occurs through special openings in the leaf called stomata (singular; stoma). Each stoma is flanked by two special cells called guard cells. Changes in the turgor pressure of these guard cells open and close the stomata and thus regulate the movement of gases into and out of the leaf. Study the diagrams and graph below and answer the following questions.



1. What is turgor pressure? _____
2. How does a change in the turgor pressure of guard cells affect their shape. _____
3. Using your knowledge of osmosis, suggest a way in which guard cells regulate their osmotic balance. _____

B. The following diagrams show what happens when a leaf of a *Mimosa pudica* is touched. The graph to the right shows the changes in turgor pressure in the cells at the base of the leaf. Study the drawings and the graph below. Then explain what is happening. The plant does not die due to touching.



Read each statement. If the statement is true, write T in the space provided to the left. If the statement is false, correct the statement in the space below the statement.

- _____ 1. Diffusion is an active process that requires a cell to expend a great deal of energy.

- _____ 2. During diffusion, molecules diffuse from a region where their concentration is low to a region where their concentration is higher until they are evenly dispersed.

- _____ 3. When the concentration of solutes outside the cell is equal to the concentration of solutes inside the cell, the cell solution is isotonic relative to its environment.

- _____ 4. In active transport, energy is required to move a substance across a cell membrane.

- _____ 5. Exocytosis helps the cell rid itself of wastes.

Select the best answer. Write your answer in the space provided.

- _____ 6. As a result of diffusion, the concentration of many substance
a) always remains greater inside a membrane
b) eventually becomes balanced on both sides of a membrane
c) always remains greater on the outside of a membrane
d) becomes imbalanced on both sides of a membrane
- _____ 7. Diffusion takes place
a) only through a lipid bilayer membrane
b) from an area of low concentration to an area of high concentration
c) only in lipids
d) from an area of high concentration to an area of low concentration
- _____ 8. The dispersal of ink in a beaker of water is an example of
a) diffusion b) osmosis c) active transport d) endocytosis
- _____ 9. Molecules that are too large to be moved across a cell membrane can be removed from the cell by
a) diffusion b) exocytosis c) lipid carriers d) osmosis

- _____ 10. Which of the following is true of facilitated diffusion?
- a) It occurs with a concentration gradient and requires transport proteins.
 - b) It occurs against a concentration gradient and requires transport proteins.
 - c) It occurs with a concentration gradient and does not require transport proteins.
 - d) It occurs against a concentration gradient and does not require transport proteins.
- _____ 11. By which process do cells transport wastes from within the cell to the external environment?
- a) diffusion b) osmosis c) endocytosis d) exocytosis
- _____ 12. Which of the following factors limits the size of a cell?
- a) Surface area of plasma membrane
 - b) Amount of DNA
 - c) Speed of diffusion
 - d) All the above
 - e) None of the above.

An analogy is a relationship between two pairs of words or phrases, and is written as a : b :: c : d. The symbol : is read “is to”, and the symbol :: is read “as:”. Select the pair of terms that best completes the analogy. Write your answer in the space provided.

- _____ 13. endocytosis : exocytosis ::
- a) phagocytosis : bacteria d) white blood cell : bacteria
 - b) secrete : exocytosis e) pinocytosis : engulfing
 - c) cold : hot

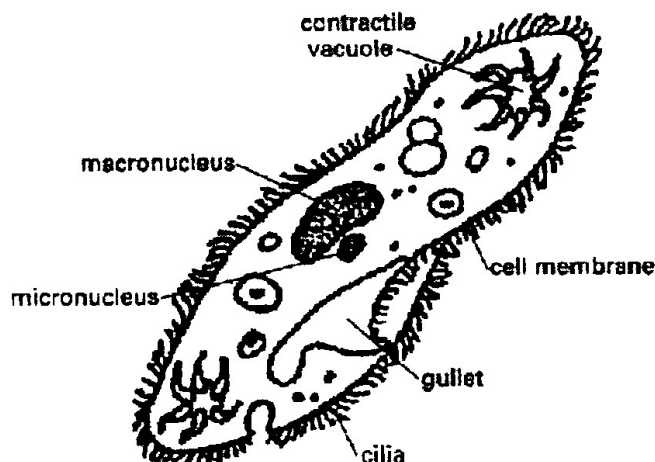
In a complete sentence answer the following questions in the space provided.

14. You are conducting osmosis experiments with a test tube of human cells in a solution. You add a teaspoon of salt to the test tube. According to the principles of osmosis, what can you predict will happen to the cell?

15. What type of solution are you dealing with in the above question?

The questions below require that you use information about several topics in order to complete the instructions. Read all information carefully.

Organisms in the genus *Paramecium* are unicellular protists. They have a number of characteristics also found in animals, such as the need to ingest food in order to obtain energy (they are heterotrophs) and they are surrounded by a cell membrane but not a rigid cell wall. They have organelles found in animal cells, including nuclei, mitochondria, ribosomes, and cilia. In addition, they have star-shaped organelles, called contractile vacuoles, that collect excess water from inside the *Paramecium* and expel it periodically to the outside of the organism. The picture below depicts a *Paramecium*.



15. Refer to the illustration above. The data presented in the table below were obtained in an experiment in which paramecia were placed in different salt concentrations and the rate at which the contractile vacuole contracted to pump out excess water was recorded.

Salt concentration	Rate of contractile vacuole contractions/minute
Very High	2
High	8
Medium	15
Low	22
Very low	30

- a) How can you explain the observed relationship between salt concentration and rate of contractile vacuole contraction?
- _____
- b) If something happened to a paramecium that caused its contractile vacuole to stop contracting, what would you expect to happen?
- _____
- c) Would this result occur more quickly if the paramecium was in water with a high salt concentration or in water with a low salt concentration? Why?
- _____
- _____